

AMENDMENTS TO THE SPECIFICATION

Please amend the specification as follows. The amendments are made for obvious and inadvertent typographical errors. No new matter is added.

[0023] Non Aluminum Binder Materials. Examples of non-aluminum binder materials for use in a sintered compact may include selected carbides, nitrides, carbonitrides, borides and silicides~~silicides~~ of Group IVa (for example, Ti, Zr, Hf), Group Va (for example, V, Nb, Ta) and Group VIa (for example, Cr, Mo, W). The non-aluminum binder material may be a mixture of any of these materials, as well as a solid solution of one or more of these compounds. The non-aluminum binder material may provide a high hardness value, a high welding value, and suitable metallic properties for the sintered compact. The non-aluminum binder material may have a grain size of greater than about 1 micron. Particularly, the heat conductivity of a non-aluminum binder may exhibit a value similar to metals. Preferably, the non-aluminum binder material is selected from one of titanium nitride, titanium boride, titanium carbide, and titanium carbide. Preferably, the non-aluminum binder material may be about 1 to about 60 vol. % of the compact, although other ranges are possible.

[0029] The mixture may be blended such that the cBN grains are dispersed, preferably in homogenous or a substantially homogenous manner, in the binder phase with little cBN to cBN~~cBN~~ bonding or contact, such as is illustrated in FIG. 1. FIG. 1 is a SEM (scanning electron microscope) image of a sintered compact, measured from a polished cross-section of the compact, wherein less than 20% of the cBN grains have grain-to-grain bonding contact. FIG. 1.

also shows that the cBN grains may be homogeneously distributed in the mixture (black grains in the structure) with very little grain to grain contact at the grain boundary. Also visible is the relative size of the cBN grains and the binder material, wherein both particles are at least about 1 micron in size. Preferably, the cBN grains are slightly larger in diameter than the binder powders. The higher the volume percentages of cBN in the sintered compact, the more difficult it may be to disperse the cBN in the binder phase well enough to minimize cBN-cBN grain contact. When cBN volume percentages approach about 60%, coating of the cBN grains with binder materials, as discussed above, may ensure that cBN grain contact is minimized.

[0030] After mixing the cBN particle and binder phase, the mixture may be dried and pressed to form semi-dense compacts having dimensions ranging from about 1 to about 15 mm thick, and about 10 to about 80 mm diameter. In an embodiment, the pressed powder bodies and containment materials may be then placed together in a high pressure sintering apparatus and sintered, preferably at a pressure of at least about 3 GPa and a temperature of about 1000 to about 1600° C[[.]], more preferably about 1000 to about 1400° C[[.]], for about 20 to about 60 minutes. The sintered compact may contain cBN grains that are uniformly or substantially uniformly dispersed in the binder phase. In another embodiment, the mixture may be dried and the resulting powder may be loaded into a shallow, flat-bottomed, cup made of a suitable material, such as cemented tungsten carbide. The cup may be covered with a refractory metal disc and sintered at about 1000 to about 1600° C. After the sintering cycle is complete and the cup is removed from the high is-pressure apparatus, the resulting compact may be machined to form a disc of PCBN supported on a tungsten carbide substrate. In yet another embodiment, the

cup may be made of a refractory metal and a tungsten carbide disc forms the covering lid. This arrangement may similarly be used for fabrication of PCBN in a tungsten carbide supported form.

[0034] The compacts of Tables 1 and 2 were formed with cBN having an average particle size of 1-20 microns. The binder constituents had particle sizes ranging from 0.1 to 5 microns. Specifically, the alumina had a particle size of 0.4 microns. The cBN and binder phase was mixed by ball milling in a steel mill using a tungsten carbide milling media with light alcohol as a milling fluid for 1-12 hours. The processed powder mixture was loaded into refractory metal cups (tantalum or niobium). The powder was leveled in the cup and a tungsten carbide substrate was loaded into the cup to enclose the powder within the cup. The blank was then loaded into a high pressure cell and subject to a pressure of 40-55 Kbar and at a temperature of about 1400° C[.] for 30-40 minutes to sinter the powder mixture and braze the formed compact to the tungsten carbide substrate.

[0041] Entries Nos. 1, 9, 14, 28, 31, 235, and 38 represent compositions within the presently described compacts.